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July 2, 1996

VIA HAND DELIVERY

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: CC Docket No. 95-185
EX PARTE NOTICE

Dear Mr. Caton:

We are enclosing as an *ex parte* a letter to Dr. Farrell, Chief Economist, Federal Communications Commission from Alexander Netchvolodoff of Cox Enterprises, Inc. Also enclosed as attachments are Gerald Brock's paper on "Incremental Cost of Local Usage" and Professor Robert Harris' response to Dr. Brock's paper.

If you have any questions, please do not hesitate to contact the undersigned.

Respectfully submitted,

Laura H. Phillips

Laura H. Phillips

LHP/css
Enclosure

cc: Dr. Joseph Farrell

04

COX
ENTERPRISES, INC.

Alexander V. Netchvolodoff
Vice President
Public Affairs

July 2, 1996

Dr. Joseph Farrell
Chief Economist
Federal Communications Commission
1919 M Street, NW Room 822
Washington, D. C. 20554

Dear Dr. Farrell:

Yesterday when we met to discuss Cox's views in CC Docket No. 95-185, you asked whether Professor Robert Harris had put any new cost data in the record with respect to the termination and transport of traffic. I have reviewed Professor Harris' paper, filed in the above-captioned docket on behalf of US West, and I can find absolutely no new cost data.

The purpose of the Harris paper in part is to criticize Dr. Brock's cost data and methodology, which criticism I submit is without merit A copy of the Harris paper and the Brock paper is attached for your convenience

Sincerely,

Alexander V. Netchvolodoff

Attachment

INCREMENTAL COST OF LOCAL USAGE

Gerald W. Brock
March 16, 1995
Prepared for Cox Enterprises

Summary

A reasonable estimate of the average incremental cost of local usage (and therefore the cost of terminating traffic received from a competitor) using digital technology is 0.2 cents per minute. That estimate is based on studies done by or supported by telephone companies. The cost is determined by peak period capacity and therefore the true cost is considerably higher than the 0.2 cents per minute average during the peak period and is zero during the non-peak period.

I. Introduction

In a separate paper prepared for Comcast, I have argued that the theoretically correct interconnection charge is cost based mutual compensation. However, cost can have many different meanings and in a regulatory context, cost based requirements can lead to interminable regulatory proceedings and disputes. Policy makers have consequently frequently sought structural methods of solving problems that do not require detailed oversight of cost rules.

One proposed structural rule is mutual compensation without oversight of actual rates, but as shown in the Comcast paper that approach is inadequate to limit the exercise of monopoly power. An alternative approach that dispenses with direct control of cost is the policy of "sender keep all" or "bill and keep" in which each party agrees to terminate traffic for the other without payment for terminating service. That is equivalent to mutual compensation with a zero price for compensation. It will be economically efficient if either of two conditions are met: (1) Traffic is approximately balanced in each direction; (2) The actual costs are very low so that there is little difference between a cost based rate and a zero rate.

Existing publicly available studies suggest that the incremental cost of local usage (and therefore the cost of terminating traffic from a competitor) is on average approximately 0.2 cents/minute. The actual cost is considerably higher during the peak period and zero during the off peak period. Thus it would not be efficient or desirable to charge at 0.2 cents/minute on a usage basis. However, the very low average number compared to the price currently charged by local exchange companies suggests that far greater distortions are likely from mutual compensation without control of rates than from sender keep all approaches.

There are two basic methods for estimating cost:

(1) engineering studies of the forward looking cost to supply a particular service;

(2) econometric (statistical) studies of the relationship between observed cost and observed outputs.

Both engineering and econometric studies provide useful information on cost. The engineering study allows one to focus on best practice technology and compute the incremental cost of adding capacity to provide a particular function. Econometric studies provide a reality check by using observed output and cost data rather than projections of expected cost. However, econometric studies may produce less precise estimates of the incremental cost of a particular service than engineering studies because they are measuring the correlation between variations in the total cost of different telephone companies and variations in the quantities of particular services provided by those companies. The cost data include costs for different embedded technologies used by the companies and are not precise enough to provide detailed estimates of the incremental costs of particular services with particular types of technology.

II. Engineering Estimate

The most comprehensive public engineering study of incremental cost was done by the Incremental Cost Task Force with members from GTE, Pacific Bell, the California Public

Utilities Commission, and the RAND Corporation.[1] The Task Force had access to data for telephone companies in California and performed a detailed engineering cost study for various output measures of local telephone service. Individual components were priced based on 1988 prices and costs were computed for switch investment, switch maintenance, interoffice transport, and call attempt costs. All costs were computed for calls during the busiest hour of the year because the investment and associated expenses are related entirely to capacity cost. The Task Force computed the following usage costs for each hundred call seconds (CCS) during the busiest hour of the year for "average" and "larger urban" exchanges:

switch investment	$ 5.00 - $ 10.00 per year
switch maintenance	.20 - .50 per year
interoffice calling	.50 - .60 per year
Total	$ 6.00 - $ 11.00 per year

In addition, the task force computed a cost of $ .30 to $.90 per year for each call attempt during the busiest hour of the year and estimated approximately 1.25 busy hour attempts per busy hour CCS.[2]

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1 Bridger M. Mitchell, Incremental Costs of Telephone Access and Local Use, (Santa Monica, CA: The Rand Corporation, 1990); reprinted in William Pollard, ed., Marginal Cost Techniques for Telephone Services: Symposium Proceedings (Columbus, Ohio: National Regulatory Research Institute, 1991) (NRRI 91-6).

2 Ibid., p. 249, 250.

There are 8766 hours per year and the ratio of the peak usage rate to the average usage rate is approximately 3.[3] That implies that one busy hour CCS is approximately equal to 2922 CCS per year (8766/3). Because one CCS is equal to 1.67 minutes, costs per busy hour CCS can be converted into average costs per minute by dividing by 4880 (2922 total year CCS times 1.67 minutes/CCS). Thus the $6.00 - $11.00 cost per year per CCS during the busiest hour of the year translates into $.0012 - $.0023 per minute. The busy hour attempt cost adds $.375 - $ 1.125 per busy hour CCS (1.25 busy hour attempts per buy hour CCS and $.30 to $.90 annual cost per busy hour attempt), raising the total cost, including busy hour attempts, to $6.375 - $12.125, and the per minute cost to $.0013 - $.0025. Taking the middle of the estimated range gives a cost of $.0019 per minute, or approximately 0.2 cents/minute.

Because the cost is determined by the the peak capacity, the actual cost per minute is much higher at the peak and is zero at the off-peak. If, for example, one assumes that an equal size peak occurs for one hour in each business day (260 hours per year of peak usage and 8506 hours of non-peak usage), then the average cost per minute would be 2.1 cents for the 8.9 percent of the traffic that occurs during the 260 peak hours each year and the average

3 Rolla E. Park, Incremental Costs and Efficient Prices with Lumpy Capacity: The Two Product Case, (Santa Monica, CA: The Rand Corporation, 1994), p. 5.

cost per minute would be zero for the 91.1 percent of the traffic that occurs during the 8506 non-peak hours.

A variety of other engineering studies have been done for specific regulatory purposes and submitted to various state regulatory commissions. For example, New England Telephone prepared an engineering study for the Massachusetts PUC that found an incremental cost of 0.2 cents per minute for local usage served by electronic switches, the same as the Incremental Cost Task Force conclusion using California data.[4]

III. Econometric Estimate

Many econometric cost studies of telecommunication have been done, but the procedures used in most of them do not allow an estimate of the incremental cost of local service. One good econometric cost study that does provide an estimate of the marginal cost of local exchange service is the one performed in 1989 by Louis Perl and Jonathan Falk of NERA, using data from 39 companies (24 Bell and 15 non-Bell) over the years 1984-1987. They developed a statistical relationship between the total cost of the individual companies and the access lines, local usage, and toll usage provided by the companies.

Four different models were used for the statistical estimation. In two of the models, the data for each company

4 Reported in Lewis J. Perl and Jonathan Falk, "The Use of Econometric Analysis in Estimating Marginal Cost," in Pollard, Marginal Cost Techniques, op. cit.

was averaged over the four year period to eliminate the effects of minor year to year fluctuations and to provide a pure cross section estimate. In the other two models, observations were used for each company in each of the four years creating a mixture of time series and cross section observations. In two of the models, calls were used as the unit of usage measurement and in the other two calls minutes were used as the unit of usage measurement.

The estimated marginal costs for local minutes ranged from 0.2 cents per minute to 1.3 cents per minute. The costs per call developed in the models using number of calls as the usage unit were divided by the average holding time to produce estimates of cost per minute comparable to the those from the models using number of minutes as the usage unit. The lowest estimate came from the model with only cross section observations averaged over the four years. The highest estimate came from the model using all observations in a pooled cross section and time series and using calls as the unit of usage measurement. All four models had good statistical properties. Although there are various advantages and disadvantages of each of the four models, none of the four can be identified as either the clearly correct approach or an approach to be discarded.

The statistical form used by Perl and Falk generates marginal cost numbers approximately equal to average cost numbers. Thus it should be expected that their estimates will be somewhat higher than the engineering estimates of

marginal or incremental cost. Furthermore, the engineering estimates generated by the Incremental Cost Task Force were developed based on digital switching technology while the Perl and Falk estimate for local minutes served by electronic switches was based on the embedded technology in 1984-87 which was primarily analog. It is likely that the incremental costs of usage capacity for analog switching are higher than the incremental costs of usage capacity for digital switching.

IV. Conclusion

A reasonable estimate of the average incremental cost of terminating traffic using digital switches is 0.2 cents per minute. That estimate is supported by the engineering studies done with data for California and for Massachusetts and by one of the econometric models developed by Perl and Falk. Other reasonable econometric models using embedded cost data produce somewhat higher cost estimates. The cost is determined by peak period capacity and therefore the true cost is considerably higher than 0.2 cents/minute average during the peak period and is zero during the non-peak period.

ATTACHMENT A

A Response to Dr. Gerald Brock
by
Professor Robert G. Harris
Walter A. Haas School of Business
University of California, Berkeley
and
Principal, Law & Economics Consulting Group

A. INTRODUCTION

Several companies (Comcast, Cox and Teleport) have retained Professor Gerald W Brock to prepare a series of papers on the economics of interconnection. Two of these firms (Comcast and Cox) and the Cellular Telecommunications Industry Association have submitted Dr Brock's papers to the FCC in support of the proposition that "sender keep all" or "bill and keep" is "a logical compensation arrangement "[1]

The FCC discussed and cited Dr Brock's findings extensively in the Notice of Proposed Rulemaking (NPRM) released in CC Docket No 95-185 [2] Unfortunately, the authors of the NPRM were sufficiently impressed with Dr Brock's analysis to tentatively propose "bill and keep" as an interim method for compensation between local exchange carriers (LECs) and providers of commercial mobile radio services (CMRS) Dr Brock claims that "bill and keep" is the economically rational way to price interconnection services if "traffic flows are very

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[1] Gerald W Brock, *The Economics of Interconnection*, (prepared for Teleport Communications Group) March 1995, preface.

[2] *See Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers*, FCC 95-505, Jan. 11, 1996, pp. 17-19, ¶¶ 32-36.

roughly balanced among the companies, or if "[t]he cost to a company of terminating traffic is low in relationship to the transactions costs of measuring and charging for traffic."[3]

In this report, I will show that Dr. Brock's papers contain fatal flaws in logic, misrepresentations of the positions of other economists and misstatements of fact regarding interconnection arrangements and Internet interconnection pricing. Hence, the Commission should not rely on either Dr. Brock's conclusions or the premises on which they are based. Instead, the Commission should recognize the wide body of established economic opinion and authority that interconnection arrangements should be reached through negotiations between and among interconnecting carriers and interconnection prices should both cover the incremental costs of interconnection services and contribute to the common costs of the public switched telecommunications network (PSTN).

In Part B of this report I will rebut Dr. Brock's contention that "bill and keep" is an economically rational way to price interconnection between two networks. "[i]f traffic is roughly equal in both directions between the two networks."[4] As Dr. Brock admits, traffic flows between LECs and CMRS carriers are not even close to being balanced, nor will they be anytime soon. Moreover, "bill and keep" is a wrongheaded interconnection pricing policy even if traffic is balanced between carriers. First, there is no way of knowing, in advance, whether or not it will be balanced. Second, setting the price of anything below its cost – including interconnection – creates an incentive to overuse it. Third, even if traffic is balanced, that does not mean the costs of interconnection are balanced. Fourth, "bill and keep" ignores the fact that there are many different technical types of interconnection among carriers: most CMRS interconnections are quite different from, and more costly than, IXC interconnection. Given

[3] Gerald W. Brock, *Price Structure Issues in Interconnection*, (prepared for Teleport Communications Group) March 30, 1995, pp. 3-4.

[4] Gerald W. Brock, *Price Structure Issues in Interconnection*, (prepared for Teleport Communications Group) March 30, 1995.

that the type and cost of interconnection differs across carriers, it does not make sense to charge the same price – much less a zero price – for different services.

Given the role of pricing in a market economy, it is not surprising that one does not observe "bill and keep" as a means of payment in competitive industries. Even the oft-cited LEC-LEC pricing of call termination in adjacent service areas is not actually a "bill and keep" arrangement: it is a negotiated method of sharing the costs of interchanging traffic, with parties contributing to costs in rough proportion to the flow of traffic and costs of termination. Thus, in Section C, I will explain why "bill and keep" is not used in other industries with analogous needs for interconnection.

In reaching his "sender keep all" recommendation, Dr. Brock relies heavily on third-party sources for the "factual" foundation underlying his conclusion. Specifically, he relies on two studies contained in a book he edited recently, one on the Internet and the other an interconnection pricing analysis originally commissioned by the European Commission. Regarding Internet pricing, cited by Dr. Brock as an example of "bill and keep," he is wrong on several counts, as I will explain in Section D. In Part E, I will show that Dr. Brock has taken key recommendations from the EC study out of context. The effect of his selective quotation is to fundamentally misrepresent the main conclusions of the authors of the report.

Dr. Brock also relies on his interpretation of an incremental cost study of urban exchanges in California, the Mitchell/RAND study. In Section F, I will show that Dr. Brock is incorrect in inferring that incremental cost estimates from this study of local exchange service are reasonable approximations of CMRS-wireline interconnection costs. He is completely ignoring the fact that there are many different types of interconnection services being used by carriers today and the cost of the Type 2A interconnection services provided to CMRS by LECs is much higher than he claims. In the section G, I recommend that the Commission hold off on adopting an interim CMRS interconnection regime and allow the current, negotiated

agreements to stand for the next six months until the Commission has a chance to develop generic interconnection and access charge rules. Section H is my biography and qualifications.

B. BILL AND KEEP IS UNECONOMIC EVEN IF TRAFFIC IS BALANCED

The central tenet of economics is that prices play a critically important role in the allocation and distribution of goods and services in a market economy (hence the name of a key body of economics, "price theory"). As a means of payment for the provision of services among competitors "bill and keep" (by any name, "sender keep all," "mutual traffic exchange" or "payment in kind") violates that principle. The centrality of prices in markets is emphasized by the idea that the prices of services should at least cover their total service long run incremental costing (TSLRIC). In my view, it is inconsistent for anyone to stress the importance of costs in pricing, then advocate that interconnection services ought not be priced at all. Surely a zero price violates the standard of TSLRIC.

Bill and keep does not provide incentives for wireless carriers to reduce costs of wireline termination. The argument that "sender keep all" allows LECs and cellular carriers to perceive the best incentives to reduce costs makes no sense. Requiring LECs to give away their services to CMRS carriers provides NO incentive for CMRS carriers to reduce the cost of terminating their customers' calls on the LEC's network. The whole point of setting prices at or above costs in a market economy is that people should pay for what they use. The "sender keep all" proposal is a transparent effort by cellular carriers to enjoy the benefits of an "in-kind exchange" of services of decidedly unequal value.

For an "in-kind exchange" to be fair to both parties, the costs borne by each party should be at least roughly equivalent. That is certainly not the case here. For the foreseeable future, LECs will continue to serve the highest cost landline customers. Hence, even if the volume of traffic exchanged is equal (and we know it will not be), the cost of providing the ubiquitous network to terminate CMRS traffic will not be remotely equal. Since CMRS providers and their

customers benefit tremendously from the ability to make and receive calls from the millions of customers served by the PSTN, they should pay prices that cover incremental costs and contribute to the common costs of the PSTN.

C. BILL AND KEEP IS NOT USED IN OTHER INDUSTRIES

Dr. Brock states that "[o]ne important goal of regulation is to bring the results of a monopolized or partially monopolized market closer to what would occur under competitive conditions. Thus, in considering the desirable price structure for regulated interconnection, the expected price structure under full competition is a useful guide."[5] This is a proposition upon which almost everyone would agree,[6] but it leads to a rejection of "bill and keep", because "bill and keep" is without empirical foundation in a market economy.

There are countless instances in which two businesses provide services to each other. In most cases, businesses price those services and collect payments based on the actual volume of services provided, just as they would for any other customer. In a few cases — when bartering is involved — firms trade services in kind, without exchanging monetary payments. Even then, the firms keep an account of what has been provided by each party to the exchange, so each party knows what is "owed" the other party. In other words, "sender keep all" [of the kind proposed by Dr. Brock] is not observed as a business practice in competitive industries.

Nor is an equivalent method of reciprocal compensation used in any other regulated network industry, so far as I know. Railroads, for example, interchange carloads with each other by the thousands, but they do not assume their traffic interchange will be balanced or the costs of

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[5] Gerald W. Brock, *The Economics of Interconnection*, (prepared for Teleport Communications Group) April 1995, p. 1.

[6] Indeed, the FCC has stated, "As with other areas of common carrier policy, we adopt policies that are intended to create or replicate market-based incentives and prices for both suppliers and consumers." *FCC Notice of Proposed Rulemaking*, CC Docket No. 95-185, Jan. 11, 1996, p. 4 ¶ 4.

interconnection equal. Instead, they negotiate interchange rates, effectively pricing the services they provide for each other. So too do financial services firms for accepting each others payment instruments (e.g., credit cards, checks and electronic funds transfers).

The Society for Worldwide Interbank Financial Telecommunications (SWIFT) which provides electronic funds message transfer services is an excellent example of how competitive interconnection services are priced in the private market place. "This private system, controlled by and for the members, allows member banks to bypass the more expensive, inefficient, and often government-controlled telex systems."[7] SWIFT charges a one time initiation and equipment installation fee to new member banks.[8] Additionally, SWIFT charges its members a volume-sensitive usage fee for each message processed, based on the length of the message, and its urgency.[9] SWIFT provides an efficient means of charging banks for terminating funds transfer messages with other banks. It is NOT "bill and keep."

Dr. Brock's assertions about bill and keep notwithstanding, the railroad and banking examples are not exceptions to the rule. In all of the industries I have studied, not once have I observed the equivalent of "bill and keep" arrangements. firms price the services they sell to each other to avoid the problems of bill and keep: opportunistic cost-avoidance, cost-shifting and cost-under-recovery. For those same reasons, "bill and keep" should not be employed as a means of "compensation" for interconnection services in telecommunications.

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7 The Payments System Committee of the Bankers Roundtable, *Banking's Role in Tomorrow's Payments System*, Vol. II, June 1994, p. 55.

8 Association of Reserve City Bankers, *Report on the Payment System*, 1982, pp. 143-144.

9 The Payments System Committee of the Bankers Roundtable, *Banking's Role in Tomorrow's Payments System*, Vol. II, June 1994, pp. 56-57.

D. BILL AND KEEP IS NOT COMMONLY USED ON THE INTERNET

According to Dr. Brock, "[t]he best existing example of interconnection under competitive conditions without regulation is the interconnection of commercial providers of Internet services."[10] Relying on another study contained in the book he edited, Dr. Brock represents to the FCC:

> "Commercial Internet service providers [ISPs] agreed that interchange of traffic among them was of mutual benefit and that each should accept traffic from the other without settlements payments or interconnection charges."[11]

Based on this factual representation, Dr. Brock concludes: "The Internet example suggests that 'sender keep all' interconnection arrangements are likely to develop in competitive communications markets as the compensation method for mutually beneficial interconnection arrangements."[12] However, the Internet study in Brock's book noted that only voluntary members of the Commercial Internet Exchange (CIX) exchanged traffic at the CIX router without settlements; it does not state that most Internet networks and providers interconnected without interconnection charges. The CIX no-settlement exchange is the only Internet example I am aware of where traffic exchange occurs without settlement. Indeed, because of the overuse and congestion on the Internet, even that limited instance of "settlement free" pricing will soon be history – evidence that "bill and keep" is an uneconomic means of pricing precisely because it removes the incentive to conserve scarce resources.

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[10] Gerald W. Brock, *The Economics of Interconnection*, undated, p. i.

[11] *Id.* p. ii, *citing* Padmanabhan Srinagesh, "Internet Cost Structures and Interconnection Agreements," in Gerald W. Brock, editor, *Toward a Competitive Telecommunications Industry: Selected Papers from the 1994 Telecommunications Policy Research Conference* (Lawrence Erlbaum Associates) 1994, p. 251.

[12] *Ibid.*

More generally, Dr. Brock is wrong in asserting that commercial Internet service providers interconnect without settlements payments or interconnection charges. As other economists familiar with the Internet have stated, "nearly all users face the same pricing structure for Internet usage. A fixed bandwidth connection [is] charged an annual fee, which allowed for unlimited usage up to the physical maximum flow rate (bandwidth)."[13] Dr. Brock is therefore wrong in asserting that ISPs exchange traffic for free. As documented in another attachment to U S WEST's comments to the NPRM, Internet providers utilize asymmetrical compensation arrangements in which networks which occupy a lower level position on the Internet hierarchy pay higher level networks for the privilege of interconnection. "Money flows upwards. Each level pays the next for connectivity and, occasionally, usage."[14] Hence, the interconnection of ISPs is indeed based on the operation of competitive, unregulated markets. To the extent the FCC "adopt[s] policies that are intended to create or replicate market-based incentives,"[15] the Internet example suggests that it should adopt rules that will encourage the negotiation of mutual compensation arrangements among interconnecting carriers.

E. BROCK MISREPRESENTS THE EUROPEAN COMMISSION STUDY

In 1994 the European Commission released a study it had commissioned from several noted American and European telecommunications economists about interconnection pricing and universal service issues in an increasingly competitive telecommunications industry.[16] These same experts summarized their study for publication in the book Dr. Brock edited.[17]

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[13] Jeffrey K. MacKie-Mason and Hal Varian, *Economic FAQs About the Internet*, Aug. 21, 1994, p. 8.

[14] Kenneth Hart, "Internet Providers Want Body to Manage Growth," *Communications Week International*, Sept. 1, 1995.

[15] *FCC Notice of Proposed Rulemaking*, CC Docket No. 95-185, Jan. 11, 1996, p. 4 ¶ 4.

[16] *See* J. Ambak, B. Mitchell, W. Neu, K. Neumann, and I. Vogelsang, *Network Interconnection in the Domain of ONP: Study for DG XII of the European Commission* (prepared for Brussels: European Commission, "*EC Study*") 1994.

Brock misrepresents the main conclusion of the European Commission study, by stating that

> "The [Arnbak, Mitchell, Neu, Neumann and Vogelsang] study found that continued regulatory oversight of interconnection conditions would be necessary in order to allow effective competition to flourish It recommended that interconnection rates be based on cost [emphasis added] and set as a capacity charge In order to apply the principal of setting interconnection charges at the incremental cost of capacity required to terminate the traffic, [emphasis added] it is necessary to estimate that cost."[18]

Surely Professor Brock understands the fundamental difference between setting prices "at cost" and setting them "based on cost," as the European Commission study recommends Brock goes on to conclude that the principles developed in the study "are applicable to the U S telecommunications market as well."[19] In so doing, Dr Brock neglects to mention in his paper that the portion of the EC Study from which he quotes was discussing theoretical pricing models — not the authors' policy recommendations In fact, the authors stated in the theoretical portion of their study which appeared in Brock's book.

> "Concluding from these observations
>
> 1. We call for cost-based interconnection charges (based on MC_{IX} or AIC_{IX})
>
> 2. We believe that cost-based charges should form the base-line but that mark-ups above MC_{IX} or AIC_{IX} may be justified depending on the incumbent's legitimate revenue requirements."[20]

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[17] *See* B. Mitchell, W. Neu, K. Neumann, and I. Vogelsang, "The Regulation of Pricing of Interconnection Services," in Gerald W. Brock, editor, *Toward a Competitive Telecommunications Industry: Selected Papers from the 1994 Telecommunications Policy Research Conference* 95 (Lawrence Erlbaum Associates, "*EC Summary*"), 1994

[18] Gerald W Brock, "The Economics of Interconnection," (prepared for Teleport Communications Group), April 1995, p. ii.

[19] *Price Structure Issues in Interconnection Fees*, p. 3.

[20] *EC Summary*, p 103 (emphasis added).

Immediately preceding this part of the European Commission study, the authors emphasized that the issue of "contribution to overhead and common costs must be addressed as it affects the viability of the incumbent"

> "Whereas the entrant's viability should, in general, not be increased by forcing the incumbent to provide interconnection below costs, the incumbent's viability may legitimately have to be safeguarded through interconnection charges above costs. Such a mark-up would be in line with the Ramsey approach already described and would have to depend on the demand relationships, the state of competition, and the seriousness of financial shortfalls."[21]

Indeed, the authors noted that "[i]nterconnection charges set at [long run average incremental cost] LRAIC would fail to provide contributions to the regulated firm's truly common costs and other justified revenue requirements. Therefore, mark-ups on this cost standard should be allowed."[22] The authors also discuss the possibility that incumbent local exchange providers might, under certain conditions, merit receiving universal service funding upon the opening of the local exchange market to competition.[23]

In addition to their belief that interconnection prices and terms should be negotiated between and among carriers, the authors offer four main recommendations regarding interconnection pricing policy:

> "From this we conclude:
>
> 1. The RA [regulatory authority] should not aim to impose interconnection charges that claim to correspond exactly to socially optimal prices.
>
> 2. The RA should define the lower and upper limits within which interconnection charges must be set.

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[21] *Ibid.* (emphasis added).

[22] *Id.*, p. 113. LRAIC means long run average incremental cost.

[23] *EC Summary*, p. 108

3 The lower limit of an interconnection charge should be that of LRAIC

4 The upper limit of an interconnection charge should be a charge calculated by adding to LRAIC a markup that, when applied to the LRAIC of each service, would lead to revenues sufficient to cover all revenue requirements (minimum uniform markup) [emphasis added]"[24]

Thus, Dr Brock is wrong in claiming that the EC Study "concludes" that interconnection charges should be based solely on "the incremental cost of capacity required by the interconnector."[25] It does quite the opposite, recommending that interconnection prices also contribute to common and embedded costs of the incumbent carriers' networks.

F. BROCK MISAPPLIES COST ESTIMATES OF THE MITCHELL/RAND STUDY

Dr Brock has stated that a "sender keep all" compensation arrangement is appropriate "if either of two conditions are [*sic*] met"

(1) Traffic is approximately balanced in each direction; [or]

(2) The actual costs are very low so that there is little difference between a cost based rate and a zero rate.[26]

Dr. Brock acknowledges that the first condition is "rarely" met and is certainly not met with the huge traffic imbalances between LECs and CMRS providers.[27] Nevertheless, Dr. Brock

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[24] *EC Summary*, p. 113.

[25] Gerald W. Brock, *Price Structure Issues in Interconnection Fees*, pp. 2-3. Prof. Brock repeats this mischaracterization in his paper, *The Economics of Interconnection*, undated, p. ii.

[26] Gerald W. Brock, *Incremental Cost of Local Usage*, (commissioned by Cox Enterprises) March 16, 1995, p. 1. *See also* Gerald W. Brock, *Price Structure Issues in Interconnection Fees*, (commissioned by Teleport Communications Group) March 30, 1995, pp. 3-4.

[27] *See* Gerald W. Brock, *Interconnection and Mutual Compensation With Partial Competition*, (commissioned by Comcast) undated, pp. 1 and 15

asserts that his second condition is present because the cost a LEC incurs to terminate a CMRS call is so low that it is nearly zero. According to Dr. Brock, the cost a LEC incurs for "terminating traffic from a competitor is on average approximately 0.2 cents/minute."[28] Since Dr. Brock is mistaken about this second condition, as I demonstrate below, there is no factual foundation for his "sender keep all" recommendation.

Dr. Brock derives his "only 0.2 cents/minute" cost estimate using several faulty assumptions. First, he cites the European Commission study for the proposition that LECs should be entitled to recover only their incremental costs in their interconnection charges. But as documented above, this is a mischaracterization of the EC Study, which actually recommends that LECs must be able to recover other costs as well, including overhead, common, and universal service costs. LECs should also be allowed to recover legacy costs, i.e., the as-yet unrecovered costs of service obligations imposed by regulators, who require LECs to depreciate their assets at unecomically slow rates.

Having incorrectly limited the LEC cost recovery issue to incremental costs, Dr. Brock then misuses the results of a RAND Study to conclude that a LEC's cost of terminating traffic from a CMRS network is nearly zero. The RAND Study examined the average incremental cost of capacity for local usage at the peak hour, limiting its investigation to large urban exchanges in California using digital technologies. The Study reported that the cost of a capacity increment that can handle one centricall second ("CCS") of traffic and its associated call attempts at the busy hour peak ranges between $6.38 to $12.13 for an "average urban" local exchange.[29] Dr. Brock spread this annual peak cost across all the traffic handled by the capacity increment, a

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[28] *Incremental Cost of Local Usage*, p. 1.

[29] A centricall second ("CCS") is equivalent to 100 seconds of call time, i.e., 1.67 minutes.

practice he himself criticizes elsewhere in his paper.[10] Dr. Brock then derives the $0.002 per minute cost estimate by taking the midpoint of the range,[11] and thereby concludes that a per-minute rate of $0.002 is close enough to zero that free interconnection is appropriate — even among carriers with severe traffic imbalances.

There are several problems with Dr. Brock's analysis. First, the RAND study examined only incremental end office switching costs, which means he did not take other significant incremental costs into consideration, including tandem-level switching and transport. If he had included tandem switching in his computations, Dr. Brock would have obtained a per-call incremental cost of at least $0.006 — a figure three times larger than his $0.002 estimate.[12] Dr. Brock's omission of tandem switching costs is significant; within U S WEST's territory 92% of all terminating CMRS minutes pass through more than one U S WEST switch (Type 2A interconnection).

Second, the RAND study estimated the incremental costs of end office switching in large urban exchanges in California using digital technologies;[13] it did not attempt to evaluate analog

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[10] *See* Gerald W. Brock, *Incremental Cost of Local Usage*, (prepared for Cox Enterprises) March 16, 1995, p. 3. ("Because the [RAND Study] cost is determined by the use peak capacity, the actual cost per minute is much higher [than $0.002] at the peak and is zero at the off-peak.").

[11] The $.002 is obtained in the following manner. A capacity increment that can carry a maximum of 1 CCS during a busy hour could carry a theoretical maximum of 8,766 CCS per year (365.25 days/year x 24 hours/day). If capacity utilization is 33.3% (which Brock takes as an assumption) actual traffic is 2,919 CCS per year (=8,766 per year x 33.3%). This converts to 4,875 call minutes per year (2,919 CCS per year x 1.67 call minutes per CCS). The $6,375 to $12,125 incremental cost is divided by 4,875 annual call minutes for an average incremental cost per minute of $.0013 - $.0025. The midpoint used by Brock was $.0019 per minute.

[12] The RAND Study estimated the incremental cost of one CCS of busy hour capacity for a local call switched through one tandem switch to be $11 to $30 per year — which, using Brock's questionable averaging technique, would result in an average per-call incremental cost of $0.006.

[13] *See* Gerald W. Brock, *Incremental Cost of Local Usage*, (prepared for Cox Enterprises) March 16, 1995, pp. 1-2.

switches (like the large 1AESS) nor costs in suburban and rural exchanges [14] Dr Brock nevertheless assumes that costs in urban digital exchanges is the same as costs in analog urban exchanges and suburban and rural exchanges This assumption is invalid

Third, as Dr Brock notes elsewhere in his very same paper, the incremental costs of the equipment studied is large at the peak hour and zero during non-peak times By averaging the high peak costs over all minutes, Dr Brock is able to obtain his "nearly zero" figure of $0.002 and then conclude that all interconnections — including at the peak hour — should be free Proposing an effective price of zero for CMRS interconnection during busy hours flies in the face of peak load pricing strategies which are used in a diverse array of industries from public transportation systems to electricity generation Peak load pricing is even used by the cellular industry itself to ration scarce spectrum during busy weekday hours.

In summary, Dr Brock's average cost estimate of $0.002 grossly understates the incremental cost of Type 2A interconnection services typically used by CMRS carriers He excluded important incremental costs incurred by LECs to terminate CMRS minutes, he did not examine the higher costs a LEC incurs with analog technologies or in non-urban exchanges, and he ignored altogether large classes of legitimate costs common costs, overhead, and legacy costs. These omissions not only call into serious question his $0.002 cost estimate, but also call into serious question whether "bill and keep" would be appropriate even under Dr Brock's stated conditions.

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[14] U S WEST's urban/suburban/rural exchange mix in its 14-state service area is much different than Pacific Bell's urban/suburban/rural exchange mix in the State of California.

G. POLICY RECOMMENDATIONS

Based on the arguments presented above, the Commission should NOT adopt "bill and keep" or any other interim measure for CMRS interconnection. The FCC should honor the existing, negotiated agreements between LECs and CMRS which will provide adequate interconnection services for the next six months. Given the expressed Congressional preference for privately negotiated interconnection agreements embodied in the new telecommunications legislation, it would be particularly unwise for the Commission to overturn the existing interconnection agreements and impose new ones by regulatory fiat. The Commission should concentrate its scarce resources on the broader access charge reform proceeding and on developing a generic interconnection regime which will apply to all the different types of telecommunications carriers.

In these generic interconnection and access proceedings the Commission should establish rules which promote negotiated interconnection prices based on costs, with reasonable markups to contribute to common, embedded and universal service costs. Within that general framework, interconnecting carriers can then negotiate different interconnection arrangements and prices based on the costs, technology, and services being used, traffic volumes, the prices of the end-user services which are interconnected, and other market factors.